

CLAIMS

What is claimed is:

1. A display device comprising:
 - a housing comprising reflective surfaces and a top opening through which
5 light is emitted for backlighting a liquid crystal display (LCD) panel;
 - an array of substantially identical light emitting diodes (LEDs) supported
on a reflective bottom surface in the housing, each LED emitting light through top
and side portions of the LED, the LEDs being separated from one another by a
distance greater than the width of a single LED; and
 - 10 a diffuser above the LEDs for providing diffused light to an LCD panel.
2. The device of Claim 1 further comprising an LCD panel over the diffuser.
3. The device of Claim 1 wherein the housing has a height, and wherein a ratio of
the height to the pitch of the LEDs is between approximately 0.3 to 1.2.
4. The device of Claim 1 wherein a pitch of the LEDs is greater than 20mm.
- 15 5. The device of Claim 1 wherein each of the LEDs output light having red, green,
and blue components.
6. The device of Claim 1 wherein the LEDs comprise only blue LEDs.
7. The device of Claim 1 wherein the LEDs comprise only UV or near-UV LEDs.
8. The device of Claim 1 further comprising phosphor over the LEDs to convert
20 light output by the LEDs into at least red and green light.
9. The device of Claim 1 further comprising phosphor over the LEDs to convert
light output by the LEDs into red, green, and blue light.
10. The device of Claim 1 further comprising a phosphor layer beneath the diffuser.

11. The device of Claim 1 further comprising a phosphor layer deposited on the diffuser.
12. The device of Claim 1 further comprising phosphor surrounding top and side portions of each LED for color-converting light emitted by the LEDs.
- 5 13. The device of Claim 1 wherein the diffuser comprises a phosphor, and the phosphor performs a diffusing function.
14. The device of Claim 1 wherein a number of LEDs are connected in series, a total voltage drop across the serially connected LEDs approximately equaling a publicly supplied standard voltage.
- 10 15. The device of Claim 1 wherein a number of LEDs are connected in series, a total voltage drop across the serially connected LEDs approximately equaling a publicly supplied standard AC supply voltage that has been rectified and filtered to be DC.
16. The device of Claim 1 wherein a number of LEDs are connected in series, a total voltage drop across the serially connected LEDs approximately equaling a publicly
- 15 supplied standard AC supply voltage that has been rectified and filtered to be DC, wherein LEDs in the array are connected to perform a rectification of the AC supply voltage.
17. The device of Claim 1 wherein the LEDs are arranged in a rectangular grid.
18. The device of Claim 1 wherein the LEDs are arranged in a hexagonal grid.
- 20 19. The device of Claim 1 wherein the LEDs are connected in groups of series-connected LEDs.
20. The device of Claim 1 wherein the LEDs are connected such that a light output of individual LEDs or a portion of the LED array can be independently controlled to adjust the light output to improve uniformity of the light applied to the LCD panel.
- 25 21. The device of Claim 1 further comprising a plurality of light sensors in the

housing for detecting an intensity of light, the sensors being coupled to a controller for controlling a brightness of LEDs associated with a sensor.

22. The device of Claim 1 further comprising a plurality of light sensors in the housing for detecting an intensity of light, the sensors being coupled to a controller for
5 controlling a gray scale level of pixels in the LCD panel.

23. The device of Claim 1 further comprising:

a first type of phosphor above the LEDs for converting light emitted by the LEDs to a first color; and

10 a second type of phosphor on the bottom surface in the housing for converting light emitted by the LEDs to a second color.

24. The device of Claim 23 wherein a combination of the light emitted by the LEDs, the first type of phosphor, and the second type of phosphor produces a substantially white light for backlighting the LCD panel.

25. The device of Claim 23 wherein the first type of phosphor is in the form of dots.

15 26. The device of Claim 25 wherein the dots are deposited on the diffuser.

27. The device of Claim 23 wherein the first type of phosphor converts blue light to one of red light or green light, and the second type of phosphor converts blue light to the other of red light and green light.

28. The device of Claim 1 further comprising a phosphor layer for converting light
20 from the LEDs to one or more other colors, the phosphor layer being formed on the LCD panel.

29. The device of Claim 28 wherein the phosphor layer is formed on a thin film transistor transparent layer in the LCD panel

30. The device of Claim 1 wherein the reflective bottom surface in the housing
25 comprises a bottom surface forming the housing.

31. A method for constructing a display comprising:

providing a housing comprising reflective surfaces and a top opening through which light is emitted for backlighting a liquid crystal display (LCD) panel;

5 providing an array of substantially identical light emitting diodes (LEDs) supported on a reflective bottom surface in the housing, each LED emitting light through top and side portions of the LED, the LEDs being separated from one another by a distance greater than the width of a single LED; and

10 providing a diffuser above the LEDs for providing diffused light to an LCD panel.

32. The method of Claim 31 further comprising an LCD panel over the diffuser.